

6. Самые знаменитые «лунные» кадры сняты с использованием кукол.

11-14 minutes

There are a few shots from the US "lunar" missions that are familiar to everyone. In the first place in terms of frequency of citation is the video fragment where Armstrong descends the ladder of the lunar module, this is the Apollo 11 mission, and the second, no less often shown plot, is the passage of an astronaut in an electric vehicle (lunar rover) from the Apollo 16 mission. You will see these footage in any lunar landing broadcast. And even just in a movie about the Moon, you will surely find a cut of these frames among others.

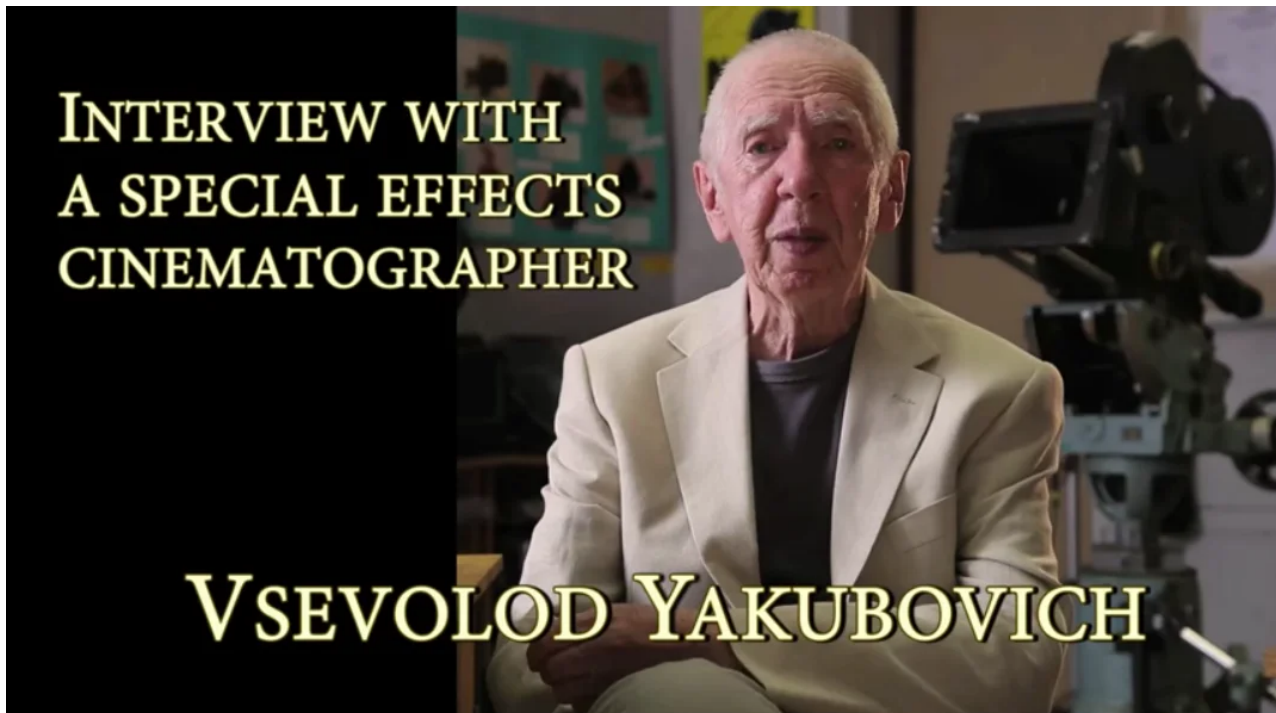
However, all these shots were filmed not on the moon, but in the pavilion. And there were no astronauts in the frame at all. In the first case ("Apollo 11"), the role of the astronaut Armstrong on the moon was played by a dwarf (about this was our [separate article](#)), then in the second case ("Apollo 16") the role of the astronaut was played by ... a doll. It was a relatively small doll, about 25 cm high, approximately the same as shown by the "mythbusters" in Episode 104 on the Moon:



Mythbusters (Episode 104) shows an astronaut doll.

The doll in the Apollo 16 mission was 8 times smaller than a real astronaut (scale 1: 8), sat motionless on a toy radio-controlled model and during the entire filming never moved either hand or foot.

Suspensions that NASA is replacing real astronauts in some cases (on general and long-range plans) with dolls have appeared for a long time, but such statements were skeptical for a long time, until professional filmmakers started talking about it. Those who are interested in the topic of the lunar scam have probably seen the interview of the operator of the combined filming Vsevolod Yakubovich.

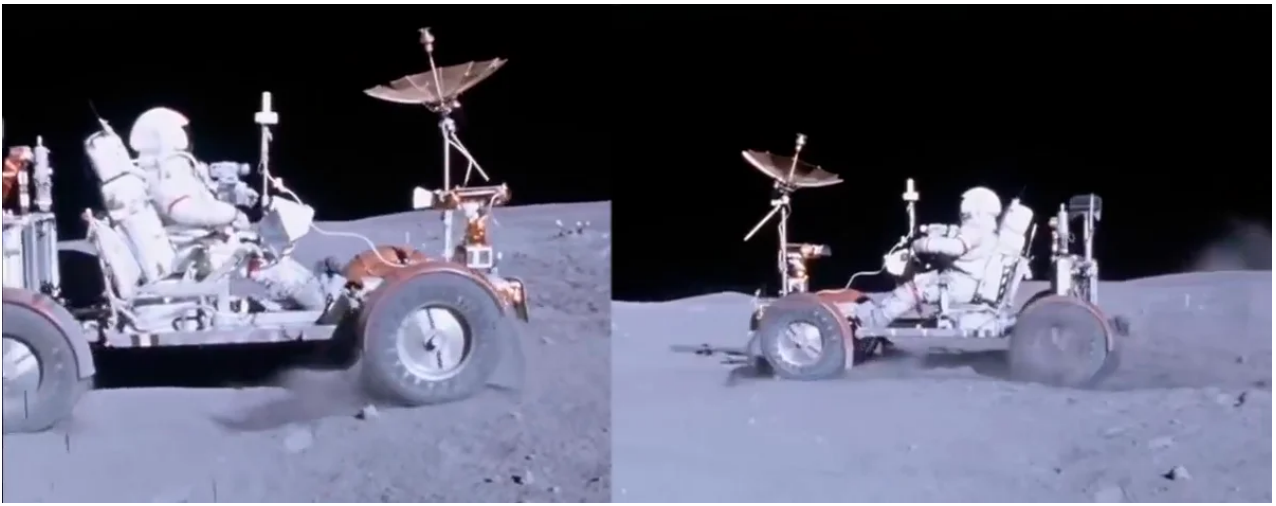


Vsevolod Yakubovich, cinematographer of Mosfilm.

V. Yakubovich is known for making combined shots for more than 80 films at the Mosfilm film studio, including such well-known films as "Crew" (the first Soviet film-disaster with planes), "The Diamond Hand", "That most Munchausen "(remember the tree that grew on the head of a deer?)," Midshipmen, forward! "," Green van "," Aibolit-66 "and many others.

The operator of combined shots not only determined that there was a doll in the frame, but also drew attention to the fact that the background in the frame is not real, but is depicted on the vertical plane of the screen. [In this video](#) , subtitles in English have been added to the [video](#) specifically for the English-speaking audience.

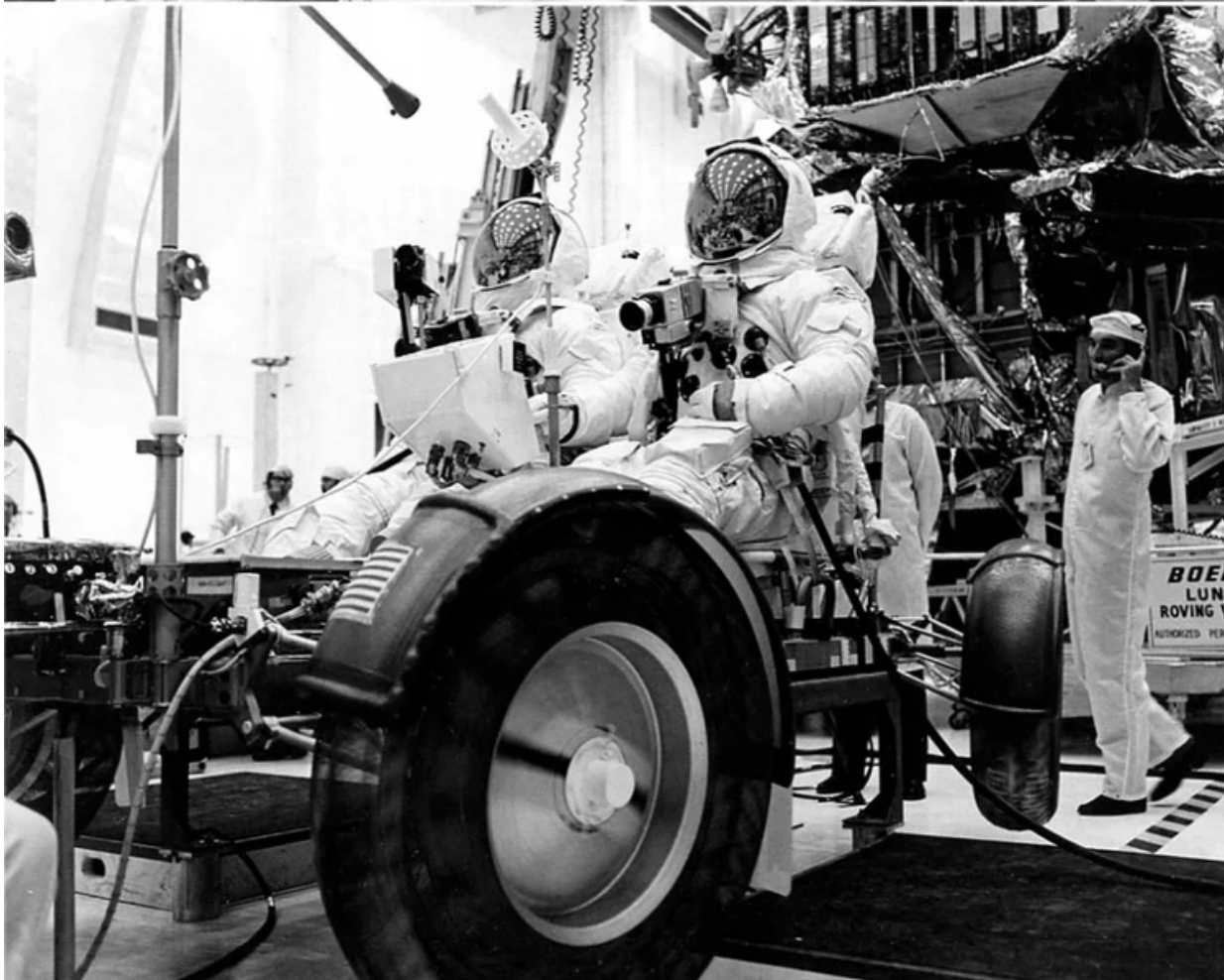
During the journey, and these are two circles - with distance from the camera and approaching, the astronaut on the rover never moved: he did not move his body, leg, or arm. The left hand, as at first hung parallel to the ground in a raised state, did not go down to the very end of the passage.



The astronaut's left hand always hangs in the air parallel to the ground and does not move.

Is that possible? Imagine that you are driving a car: your right hand is busy with steering, holding the steering wheel. Now extend your left arm forward so that your forearm, wrist, and hand are parallel to the ground. Will you be able to drive two circles in this position, back and forth, back and forth, with turns, so that the left hand never moves? Have you presented? Have you tried it? Does it work?

Will not work! In a living person, the hand will instinctively drop to one knee. Compare these "lunar" shots with how the astronauts from the Apollo 16 mission behaved on Earth on training races - the driver's left hand (he is closer to us in the photo) lies on his hip near the knee. Moreover, this applies not only to those moments when the rover is stationary, but also when the rover is moving or when motion simulation occurs, and the front wheels are rotating.



Training on the rover, the front wheels of the rover are rotating (bottom photo). The left hand is down.



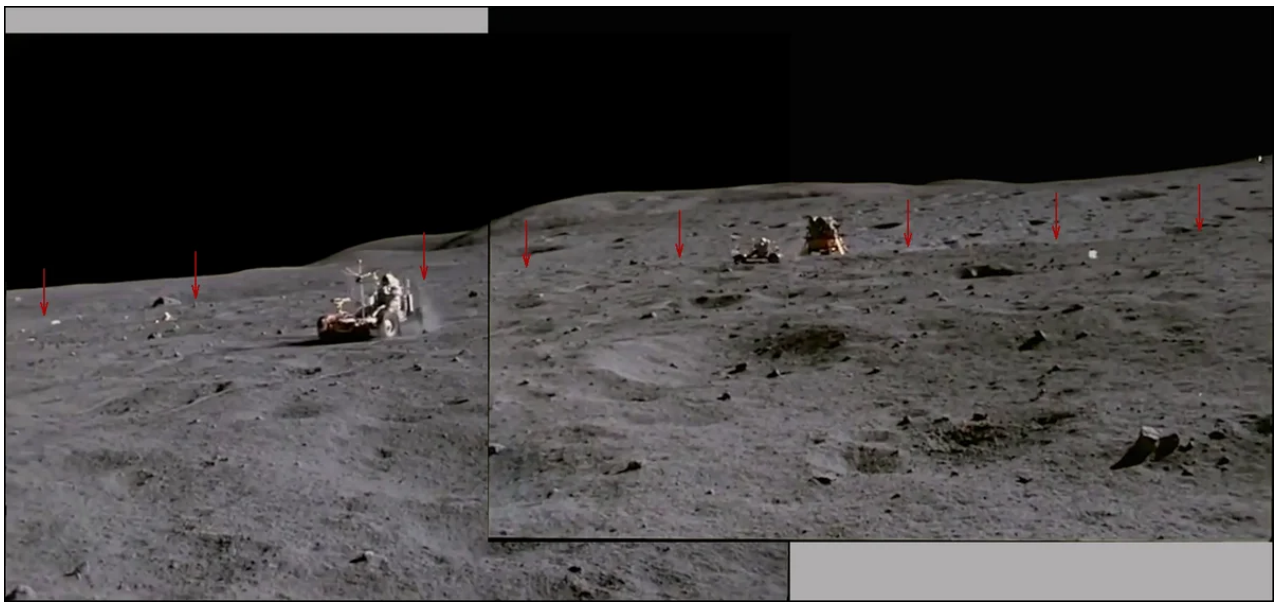
Practice ride on a rover.

We looked at a ton of photos of training with the rover - the driver's left arm is always down, regardless of whether the astronaut is in the spacesuit or not. It is uncomfortable to hold your hand in the air. But the doll can keep its arm outstretched for an indefinite amount of time.

In addition to this detail, the operator V. Yakubovich drew attention to the clear border separating the foreground soil from the image of the soil against the background. The upper and lower half of the frame differ in color and texture.

The cinematographer's conclusion was unambiguous: the interface indicates the use of combined shots, when the lower and upper parts of the frame were obtained in different ways: the lower part is the fill soil lying in the pavilion in the horizontal plane, and the upper part is the image on the vertical screen.

These shots with the passage of the rover seem to be filmed by the second astronaut. What do we see while panning? The filming camera, accompanying the rover, rotates more than 120 °. At the same time, along the entire length of the route, the interface remains approximately at the same distance from the survey point, in other words, it goes in a circle of a certain radius.



Half of the rover movement panorama, two frames. Along the entire path, behind the rover, the border between the upper and lower parts of the frame is visible (indicated by arrows).

The decoration of the lunar landscape is very similar in its execution to a diorama. A diorama is a pictorial painting curved in a semicircle in the form of a ribbon, with a foreground of volumetric objects, which can be some kind of structures, real objects or fake ones, made to scale.

We believe that the lunar hills in the background (during the rover's passage) were drawn by the artist based on the lunar photographs, and then placed in a circle in the form of a diorama. Automatic lunar stations (Luna-9, Surveyors) have already transmitted to Earth the view of real lunar landscapes, so it was not difficult to draw them.

About 15-20 years ago, when the quality of the video picture on the Internet was very low, with a resolution of 320x240, it was difficult to understand who was driving the rover there. But when a new scan was made from 16 mm film with FullHD resolution, and even (watch the video)[stabilized the image](#), it immediately became clear that in front of us was an immobile doll, whose arm on the console only slightly swayed due to shaking during the ride.

Why did you need to use a doll, although such a simple passage, it would seem, could well be filmed on a full-size model of a rover and put a real person on the rover?

There are two reasons for this. The first reason is the difficulty of brightly illuminating a large area with a single light source that simulates the sun. Imagine that you decide to evenly illuminate a football field with **one** spotlight at night. You will have to carry the spotlight about 200-250 meters and make the widest angle of the beam.

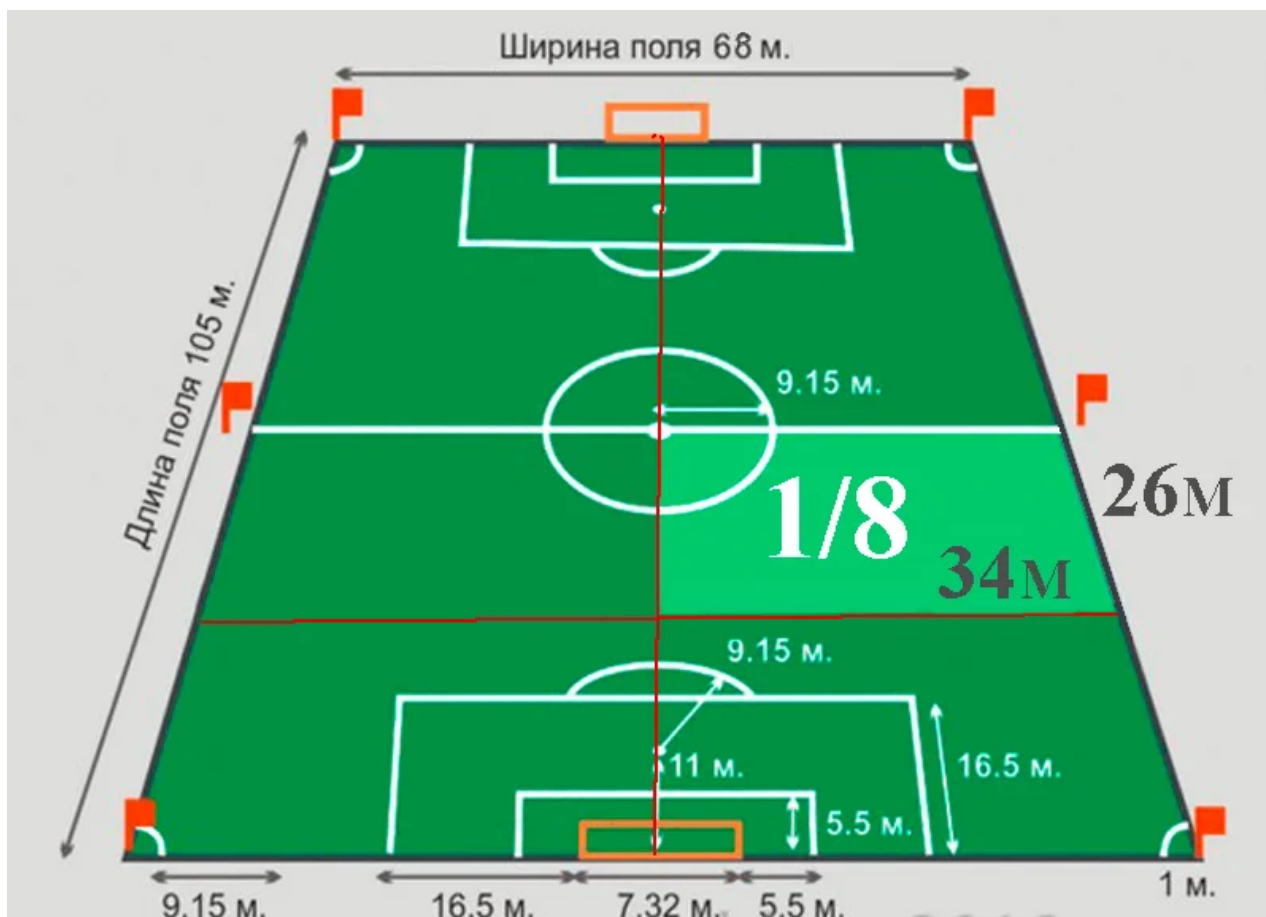


A stadium with a football field from a distance of about 200 meters.

In this case, the illumination on the field will be very low, slightly more than on a moonlit night (full moon). Under such conditions, it will not be possible to shoot anything, because the photosensitivity of color films in those years was very low. Film enthusiasts shot on films with a photosensitivity of 50-100 ASA units, and the most highly sensitive film was considered to be 160 ASA units. This is the sensitivity of the film, according to NASA, used for filming the rover.

Now, when on any digital camera you can set the sensitivity of 3200 ASA and more, and the minimum value sometimes starts from 200, it is already difficult to imagine that 160 units in those years was considered the highest sensitivity. For this sensitivity, 160 units, you need a lot of light.

If you use models on a scale of 1: 8, then the entire scene with the rover can be filmed in a pavilion with a shooting area $\frac{1}{8}$ or even $\frac{1}{10}$ of a football field - a 34 x 26 meter area is enough.



The size of the football field according to FIFA recommendations, 1/8 of the field is highlighted in color.

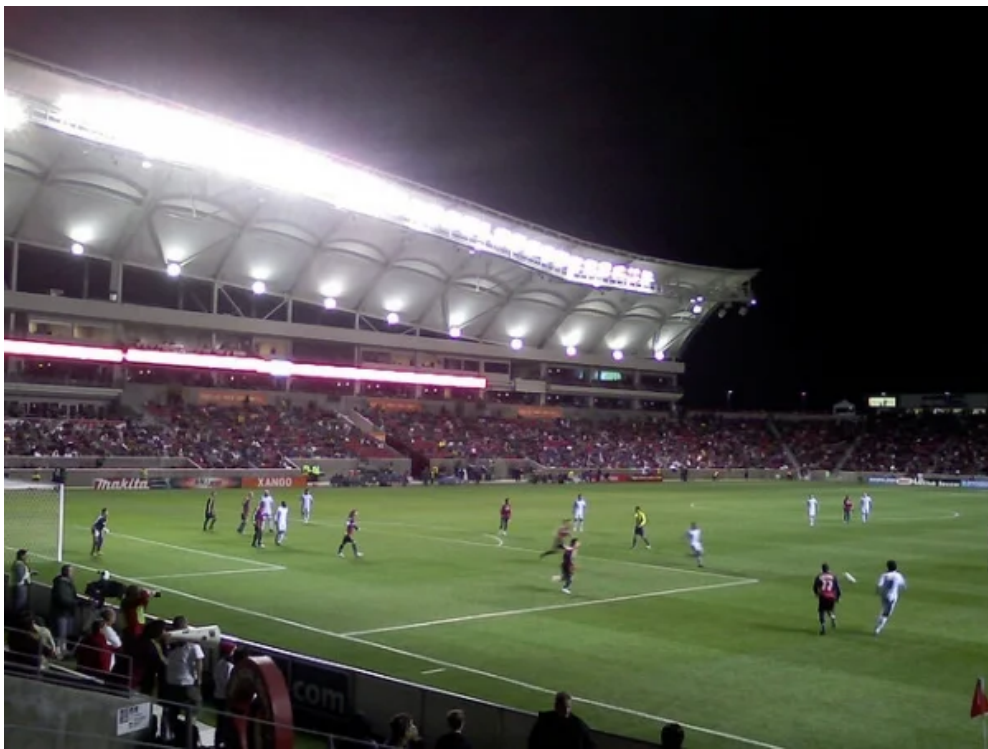
It is quite possible to illuminate such an area with one anti-aircraft searchlight with a mirror diameter of 1.5 meters, imitating the light of the Sun. This is the most powerful lighting fixture.



Anti-aircraft searchlight with a mirror diameter of 1.5 meters, serially produced in the USA.

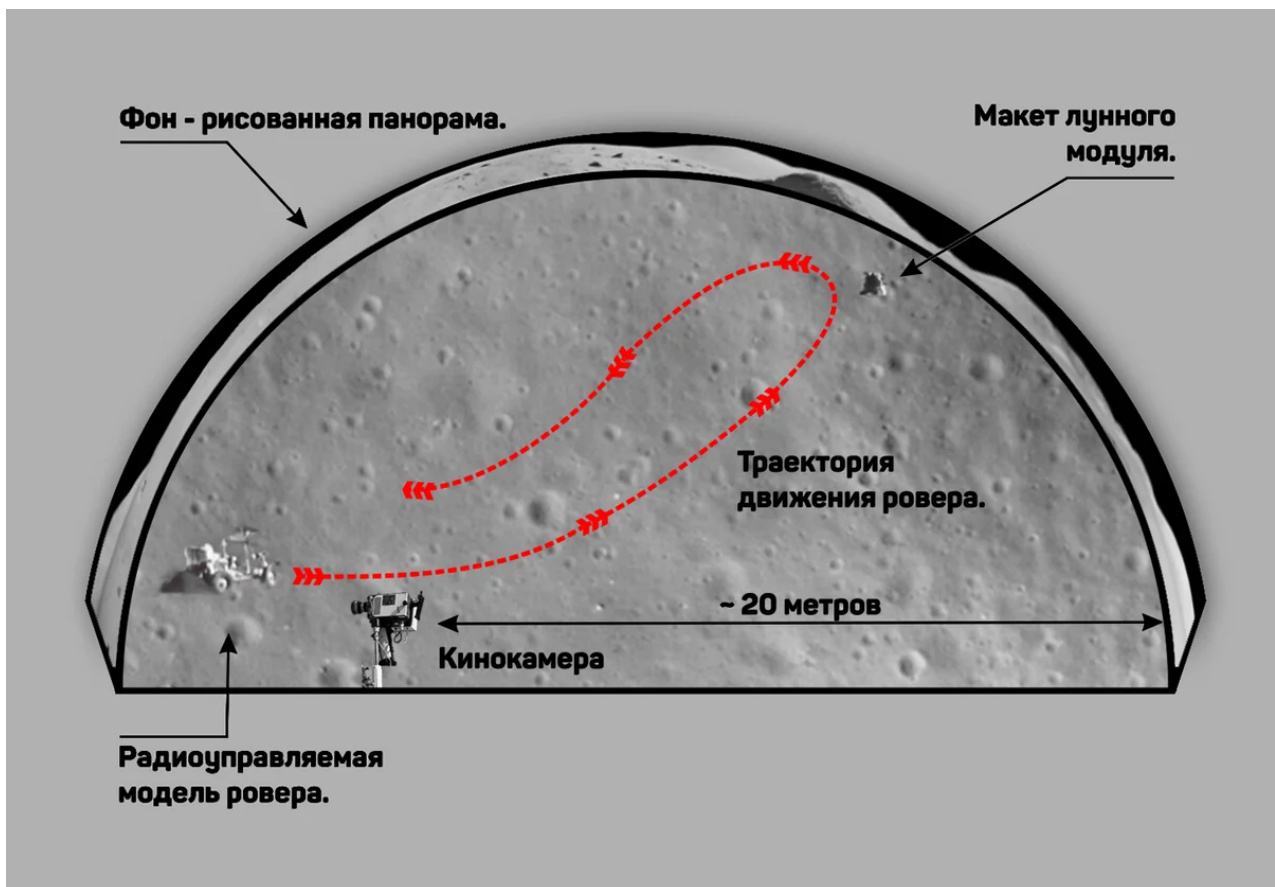
If you use a rover in real size, and not in 1: 8 scale, then you need a pavilion 8 times longer and 8 times wider. The area will increase 64 times. Instead of the size of 1 / 10th of a football field, the pavilion area will be about 6 football fields ($1/10 \times 64$). It is simply impossible to illuminate 6 football fields with one device, so at least 60 of the most powerful lighting devices are required. How to place them if you want to create the feeling of a single source of light, like the light from the Sun?

In stadiums, lighting devices are usually placed as follows:



Evening illumination of the football field in the stadium

According to the cameramen, the entire rover passage was filmed in a small pavilion with a painted background located around the circle.



Shooting scheme in the pavilion of the rover passage for the Apollo 16 mission

There is a second reason, more important, for the use of dolls. With the real dimensions of the rover, it is impossible to make the sand fly out from under the wheels to a great height. On the forums, you can find a lot of

mathematical calculations showing that under lunar gravity, particles of sand from under the rover wheels (at a maximum speed declared by NASA of 18 km / h) should rise to a height of more than 2 meters, i.e. much taller than the rover itself.

It is simply impossible to capture the sand outreach up to 2 meters in height (at a rover speed of 10-18 km / h) on a full-size model. In terrestrial conditions, even at a sand separation speed of 36-40 km / h (which is 2 times the maximum speed of the rover), the sand rises to a height of no more than 1 meter.



Under terrestrial conditions, the sand from under the wheels does not rise above 1 meter.

But on a small copy, you can easily make the sand fly above the model.



A scaled-down RC model moves through the sand.



This is how this model looks like close up. Photo from the Internet.

Using a scaled-down model allows you to achieve the effect of high emission of sand particles, 2 times higher than the model itself. It's almost like on the moon. Thus, part of the task - creating the effect of movement as if on the Moon - is solved with the help of a scaled-down model.

It remains to decide the last moment: the sand "like on the moon" must very slowly fall down. Since the acceleration of gravity on the Moon is 6 times less than on Earth, the display speed must be slowed down by the square root of 6, i.e. 2.46 times. In other words, in order for the sand to fall down more slowly when showing a movie clip (as if on the moon), it must be shot at a speed 2.5 times higher than the standard speed - at 60 frames per second, and projected at 24 frames per second.

According to cinematographers, the most famous rover travels on the moon are just combined footage shot in a small pavilion using a doll and a radio-controlled model. The model was about 8 times smaller than the real prototype. The role of the removed background was played by the painted backdrop, which was located around the circumference. The shooting speed was set specially overestimated, 60 fps, in order to get a 2.5 times slower effect when projected at 24 fps, like the effect of weak lunar gravity.

*

Continuation: "What a trick to hide that we have a toy rover in front of us . "

Cameraman L. Konovalov was with you.



I expose the light on the actor A. Semchev (known for advertising: - Where have you been? - Drank beer!)

Until next time!